

# Rolling Rye In the Upper Midwest



**Erin Silva, Organic Production Specialist**  
**University of Wisconsin, Dept of Plant Pathology**

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# Why move to no-till?

- Soil health
- Effective weed management



# Organic Yields at WICST

- 18 to 20-year means show organic systems yielding well (~90% of conventional systems)
- Organic grain crop trends are positive – yields are increasing with time

	<b>Conventional</b>	<b>Organic</b>
Corn	174 bu/ac	166 bu/ac
Soybean	52.5 bu/ac	47.4 bu/ac
Wheat	67.6 bu/ac	55.8 bu/ac
Alfalfa	4.83 tons DM/ac	5 tons DM/ac

# Effect of weed pressure on soybean yields

	Wet Springs (May + June > 10" rain)		Normal Springs	
	ARS	LAC	ARS	LAC
	-----bu/a----- -----			
Conventional (min-till corn-soybean)	48	57	57	53
Organic (3-yr grain)	38	44	54	49
Org:conv	79%	76%	95%	92%

# Organic Cover Crop-based Reduced-tillage

- Focused on limiting tillage in certain phases
  - Soybean phase most reliable
  - Corn phase possible?
- Use fall-planted cover crops to smother weeds
- Cover crops terminated in spring
  - Rolled-crimped or mowed
- Cash crops planted following cover crop termination
- No or limited cultivation needed for weed control



# Roller-Crimper



- Ground-driven
- Can be purchased from I and J Manufacturing
- Plans on Rodale website ([www.rodaleinstitute.org](http://www.rodaleinstitute.org))
- Front or rear mounted

# Typical cover crops used

- Cereal grain
  - Winter rye – adequate biomass, winter-hardiness, and allelopathy
  - Triticale?
  - 3 bu/ac
- Legumes?





# Ground cover on April 1<sup>st</sup> across rye seeding dates



Mirsky, USDA



**Crimping must be performed at  
anthesis to ensure complete  
termination of crop with no  
regrowth**



# Bounce-back at different rolling dates

Photos taken on July 31, 2015



May 15



May 22



May 29



June 5



Rolling dates, from earliest to latest

Liebert and Ryan



# Seed-to-soil contact

- Adjust seeding depth and add weight based on cover crop biomass and soil moisture
- Use closing wheels
- High planting rates



Liebert and Ryan



July 15





July 17, 2016





September 13, 2016





# Soybean Yields across Experiments

	<b>Till(bu/ac)</b>	<b>Cover Crop No-Till (bu/ac)</b>
2009	47	30
2008/2009 (Bernstein)	54	43
2011	52	53
2012		drought
2013	50	45
2014	47	44
2015	60	55
2016	57	61
2017	48	47

# **Cover Crop-based Organic Reduced Tillage Trials and Demo 2017 Results**

## **Arlington Agricultural Research Station**



**Organic and Sustainable  
Agriculture Research and Extension**  
DEPARTMENT OF PLANT PATHOLOGY  
UNIVERSITY OF WISCONSIN-MADISON

# Overview

1. Organic no-till soybeans ...
  - ... in winter cereals
  - ... in spring planted cereal rye
2. Organic no-till corn
3. Interseeding cover crops in organic corn



# No-till soybeans in winter cereals



- 6 acres total
- 0.3 acre per plot (30x450ft)
- 4 cover crops, one control
- 4 replications per treatment

# Cover crops

		Drilling			
Species	Variety	Date	Rate	Depth	
Triticale	NE426GT	Sept 19 <sup>th</sup> , 2016	3bu/ac	1.75"	
	815				
Cereal Rye	Aroostook	Sept 26 <sup>th</sup> , 2016		3bu/ac	1.25"
	Spooner				



John Deere 1590 no-till drill

## Cover crop biomass before crimping

Aroostook-rye –	11,212	} Lbs of dry matter / acre
Spooner-rye –	11,315	
NE426GT-triticale –	12,721	
815-triticale –	15,137	

# Soybeans

- 1.7 Relative Maturity soybeans – 30 inches row – 225,000seed/ac - 1” deep
- 2 Planting strategies
  - **Early planting**, (planting green) in the standing cover crop at boot stage  
May 12<sup>th</sup> - rye and control  
May 20<sup>th</sup> – triticale
  - **Late planting**, planting at crimping in the rolled cover crop at anthesis  
June 2<sup>nd</sup> - rye and control  
June 8<sup>th</sup> - triticale





# Early planting John Deere 1750 Max Emerge Plus





# Early planted soybeans



Soybean germination

Planted in standing cover crop,  
Seed trench not closed



Planted in bare ground,  
Seed trench fully closed



# Late planting and crimping - modified AGCO planter - Rodale roller crimper





# Modified AGCO planter

- No-till coulters
- Double disc openers
- Down pressure strings
- 1,200lbs weights





# Cover crop and pests – Armyworms

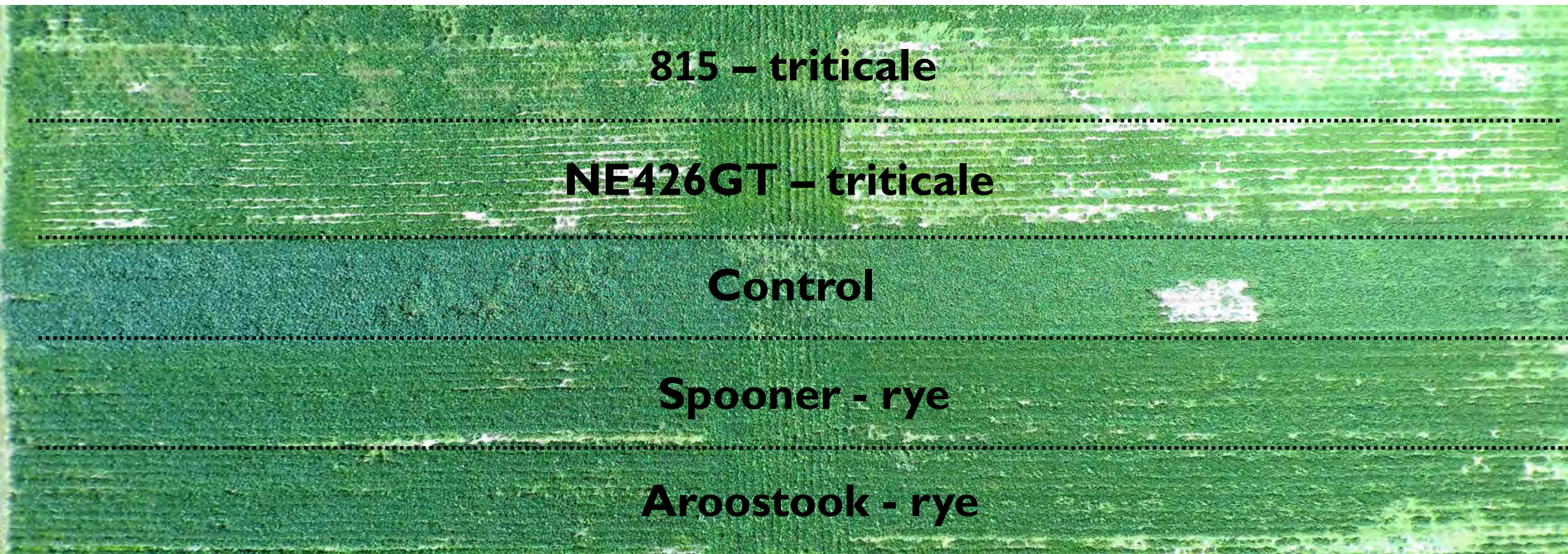


- Lay eggs in grassy plants
- June 15<sup>th</sup> Entrust® (3oz/ac)



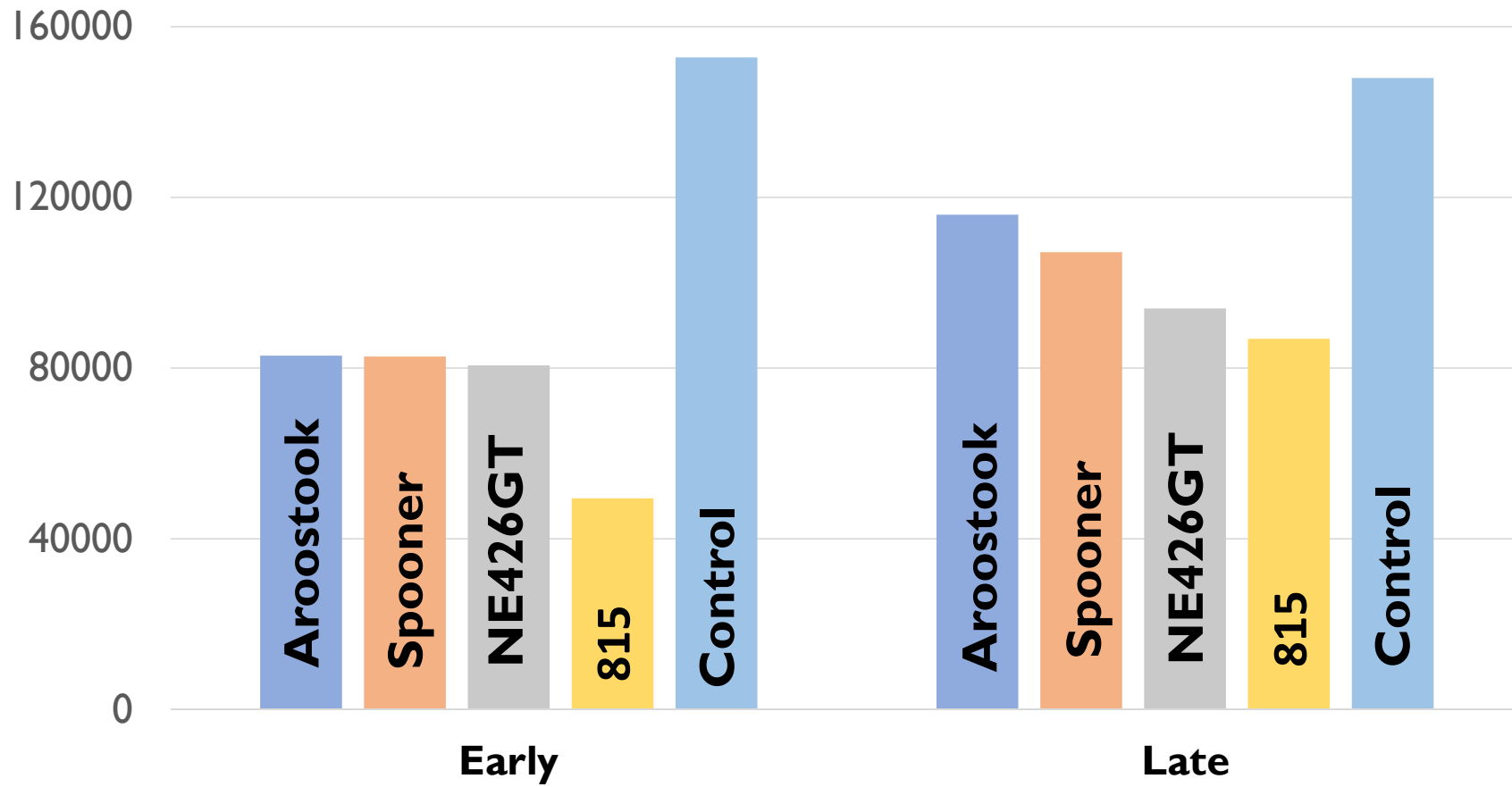
# Overhead drone view, mid-August

Photo credits – Roger Schmidt - rwschmidt@wisc.edu



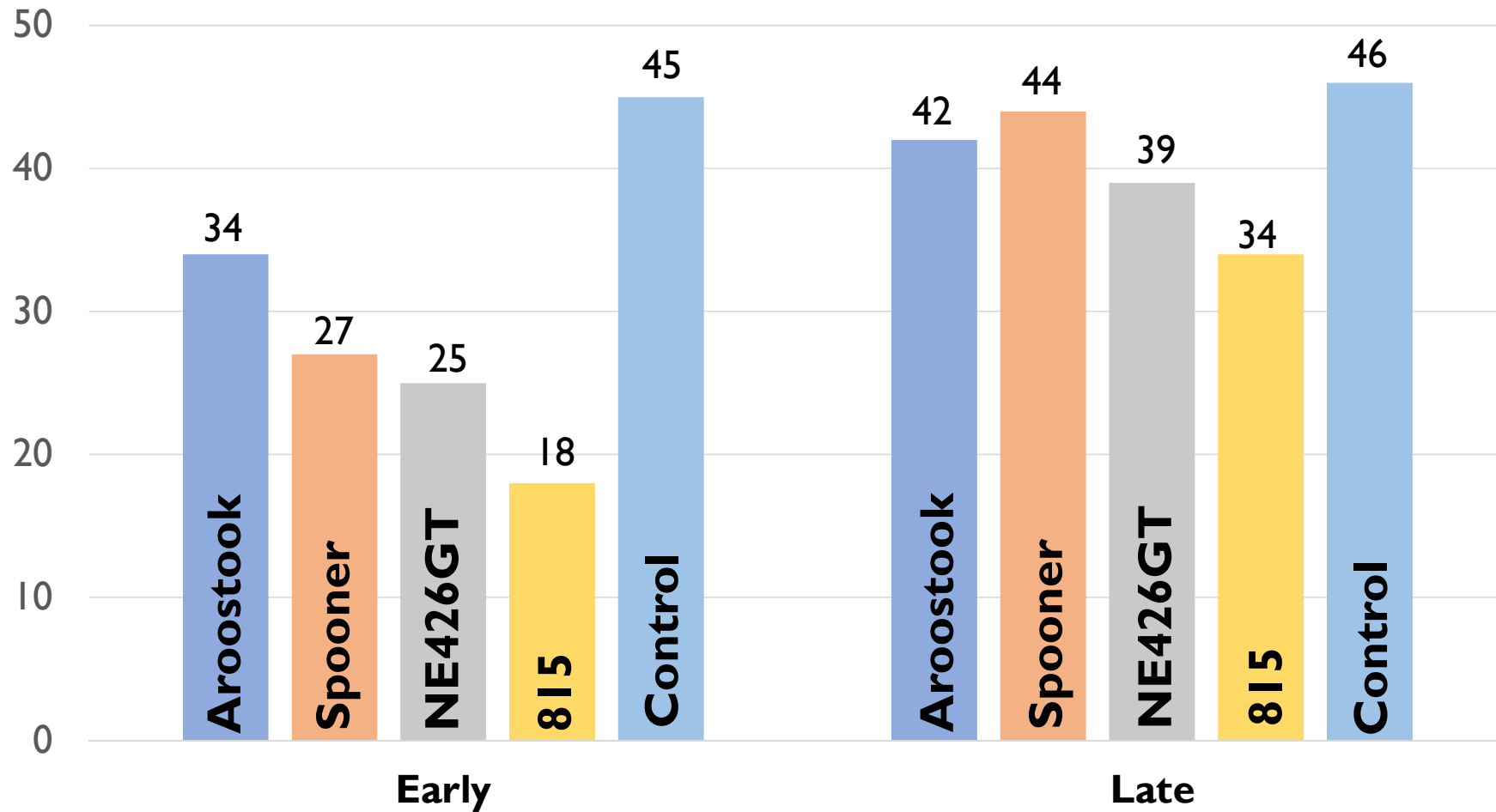
← Late planted soybeans →      ← Early planted soybeans →

# Soybean stand count (plants/acre)





# Soybean yield (bushels/acre)



# (Cover cropped/control) ratios

	% Control			
	Early		Late	
	Stand	Yield	Stand	Yield
Aroostook	55	75	77	92
Spooner	55	59	71	97
NE426GT	54	55	62	86
815	33	40	58	75

- The yield ratio is 20% higher than the stand ratio
- 90% of the yield from 70 % of the stand

Soybean stand looked poor in NT soybeans, which seemed alarming, but they did partially compensate

# Conclusion and plans for 2018

- Not a one-fits-all system
  - Planting date – climate, number of paths, RTK
  - Cover crop variety – maturity, over-wintering capacity
- Next year
  - Early planting vs. Late planting
  - 4 Cover crops – ‘Spooner’ and ‘Aroostook’ rye, ‘NE426GT’-triticale, **‘Emmerson’ wheat**
  - **Economic analysis**
  - **Equipment modification (closing wheels, down pressure ...)**



# Soybeans in spring-planted cereal rye

- Key principle – Vernalization  
*« need for exposure to a period of cold in order to flower »*



- April 12th :  
‘Spooner’ rye, 2bu/ac, drilled at 1” deep
- May 26th :  
1.7 Relative Maturity soybeans, 250,000 seeds/ac, drilled at 1” deep



# When it doesn't work ...

**Stand count : 16,521 plants/ac**



**June 19th**

**Yields : 21.5 bu/ac**



**September 25th**



# When it works ...





# No-till Corn - Overview

- Our program – new phase of research
- States on more southern latitude may have success with no-till corn into hairy-vetch + cereal rye
- Legume cover crop needs to be integrated for nitrogen availability and pest avoidance
- Overwintering legume that can be terminated effectively and enable to plant the corn early enough

# No-till corn – Cover crops

Trial	Cover crop	Date	Rate	Depth
N°1	Lynx Peas	Fall - Sept 19 <sup>th</sup> , 2016	50lbs/ac each	3"
	Shelby Oats			1"
N°2	Chickling Vetch	Spring - April 12 <sup>th</sup> , 2017	200lbs/ac	0,5"
N°3	4010 Field Peas	Spring - April 12 <sup>th</sup> , 2017	200lbs/ac	0,5"

No cover crop  
in the spring

# No-till corn

- 85 days corn - planted green on June 8th – 38,000 spa
- Cover crop on June 12th - 4 days after planting corn



4010 Field peas



Chickling Vetch



# No-till corn

Corn development - June 19th



June 27 :  
Roller crimper on cover crop  
+ corn at V1

... no picture and not a success

# No-till corn - Results

NT corn in field peas on July 24th



Yields (silage at 35% DM)

Standard : 29 t/ac

No-till : 17 t/ac

# Conclusion and plans for 2018

- Corn isn't as resilient as soybeans and is more impacted by the roller crimper
- Peas and vetch termination wasn't successful and we had poor weed suppression
- Next year
  - Fall-planted peas and oats
  - Looking for other spring-planted legumes
  - Working on other strategies for cover crop termination



# Interseeding cover crop in corn

- 85 days corn and inbred corn, both planted on June 8th



- Cover crops interseeded on July 6<sup>th</sup> between corn row at V5

Cereal rye – 180 lbs/ac



Red Clover – 10 lbs/ac



Daikon Radish – 10 lbs/ac



# Interseeding cover crop in corn - Results

After harvest – Typical corn



After harvest – Inbred corn



- Interseeded cover crop suffered from combination of shade and drought
- Will try interseeding again



# Thank you for joining!

Erin Silva – [emsilva@wisc.edu](mailto:emsilva@wisc.edu)


Léa Vereecke – [vereecke@wisc.edu](mailto:vereecke@wisc.edu)

(608) 890-1503

<http://www.uworganic.wisc.edu>

<https://ograin.triforce.cals.wisc.edu>

**Fact Sheet Series**



**18-1 NO-TILL SOYBEAN TRIAL 2017**

### Introduction

This organic no-till soybean trial is part of a larger organic no-till cropping system trial initiated in 2017 at the Arlington Agricultural Research Station. The trial is a four-year rotation including corn, soybean and a small grain. In the soybean phase of the rotation, reduced tillage is accomplished by using a fall planted small grain, with the soybeans direct planted before or after termination of the cover crop with a roller crimper.

In this fact sheet we compare the performance of different small grains as cover crops, as well as different soybean planting dates and crimping timing. If you are already using organic no-till, our results can help you fine-tune your system. If you're interested in implementing organic no-till in the future, these results will help you be aware of the sensitive points of the system.

### Description of the trial

Cover crops used, planting and crimping strategies

**4 cover crops, one control**

- Two varieties of cereal rye: Aroostook, Spooner
- Two varieties of triticale: NE426GT, 815
- One Control; no cover crop, relying on cultivation for weed management

**2 planting strategies for soybeans**

- Early planting: the soybeans are "planted green" in the standing cover crop when it reaches boot stage
- Late planting: the soybeans are planted in the rolled cover crop, at the same time as rolling (optimal) or a few days later if soil and weather condition are not favorable

**2 crimping strategies (only applies to early soybean planting)**

- "Typical" crimping: when the cover crop reaches full anthesis, soybeans are newly emerged - about VE stage
- Late crimping: past anthesis for the cover crop, soybeans are putting out true leaves - about VC/V1 stage





Figure 1 - Drone view of soybean plot, May 26, 2017 showing rolling Aroostook-rye. Late planted treatments at the top, early planted treatments on the bottom, a driveway in the middle. There are 4 repetitions of the 5 different treatments.

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Page 1